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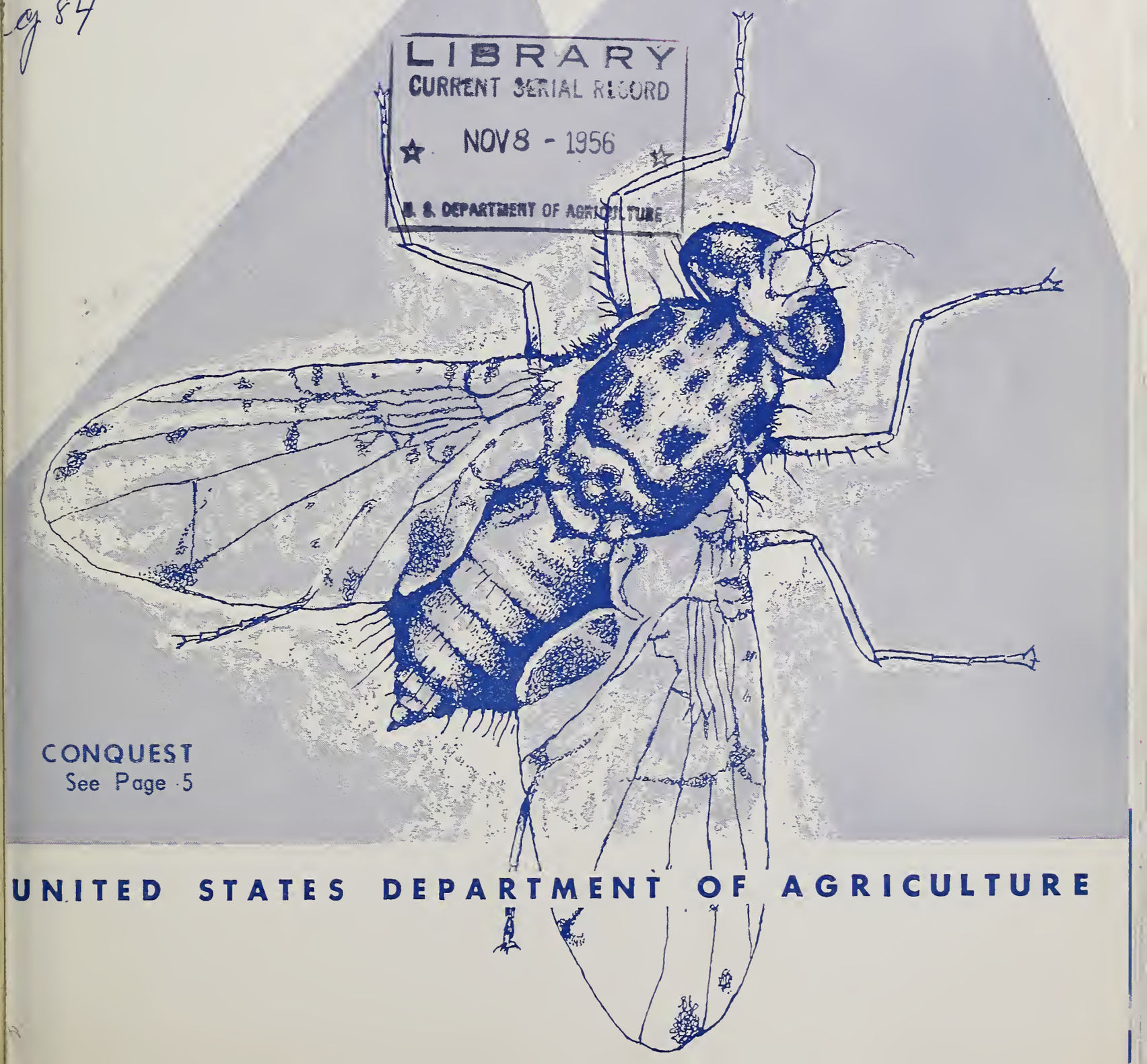

CONQUEST
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UNITED STATES DEPARTMENT OF AGRICULTURE

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Research

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A Base

Home-economics researchers are more and more applying science to everyday living in the homes of our country.

One of the most vigorously worked home-economics fields has long been food and nutrition. That's understandable. Food is closely tied to health. And food takes a greater share of the average family budget than any other expense.

A growing volume of research-based information helps people choose their meals more wisely and use our ample food to good advantage. We're eating more milk, meat, eggs, and nutritionally important fruits and vegetables these days.

Home-economics research has made important contributions to fundamental knowledge: information on nutritive values of food and how to retain them during food preparation; on human requirements for these nutrients; on food costs and habits, for planning healthful, palatable diets. For example, a half century ago, we had information on about 100 foods, in terms of 5 constituents. Today, we have composition tables on more than 750 foods and 3 times as many constituents.

You may remember the accomplishments in planning good nutrition at low cost during the depression years and in improving home processing methods during World War II.

Home-economics research has also contributed to the school-lunch program and the accepted practices of social agencies, as well as to guidance of food distribution programs.

Achievements have been many. But people are constantly looking to home-economics researchers for *up-to-date* information. We need new facts, better information on many fronts.

Here are a few examples: To keep up with changing markets and growing concepts of nutrition, more foods and more nutrients should be covered in the food-composition tables. Then, too, we need to know more about the physiological availability of nutrients from different foods. And the incompletely understood role of fat in human nutrition is an urgent matter. in view of the increasing number of older people in our population and the apparent relation of diet to health.

We must continuously build up our fundamental knowledge as a base for further research and for nutrition education.

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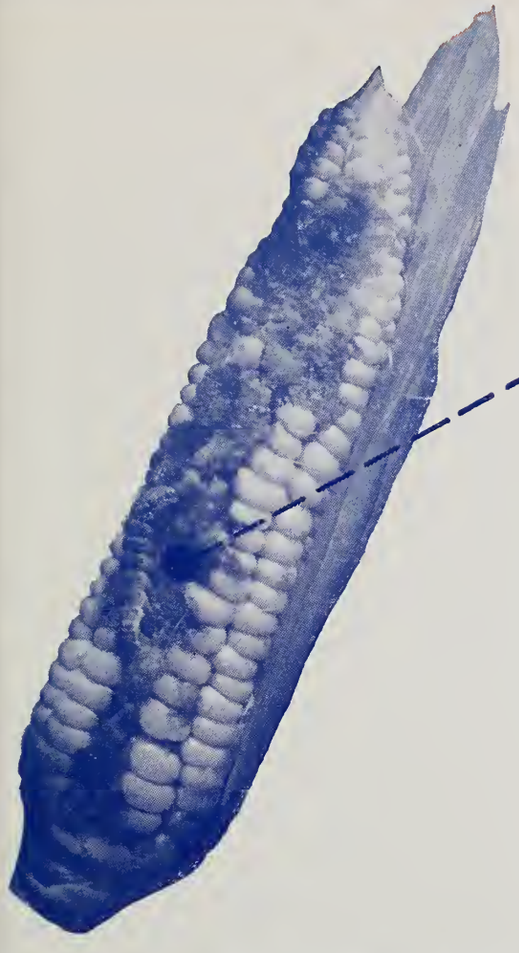


RAISING CORN'S *Earworm Resistance*

Researchers are discovering sources of resistance and it is being bred into our commercial field and sweet corn

■ TWENTY YEARS of breeding and testing field and sweet corn for resistance to corn earworms is paying off.

Cooperative work by entomologists and corn breeders of USDA and several State experiment stations has brought to light several corns of both types that will have only half as much earworm damage or less to the ears than most of the corn being grown. For example, in 50-bushel-an-acre southern field corn, loss occurred at the rate of 3.2 bushels in the susceptible Station Mosby variety—but 1.9 bushels in somewhat resistant Dixie 17, only 0.5 bushel in resistant Dixie 18, and just 0.2 bushel per acre in very resistant La. 1030.

Earworm damage is quite variable but averages about $50 million a year. In one State, Illinois, the toll in field corn has been estimated at $3.9 million last year, $19 million in 1954, and $10 million in 1953. It is very costly in sweet corn, too—took about a third of the crop or $100 an acre in Mississippi in the heavy infestation of 1948. Loss in a field corn for feed is limited to the amount actually destroyed. But a moderately damaged ear of sweet corn can be unacceptable to consumers and a total loss; even slight damage will call for trimming, at extra cost.

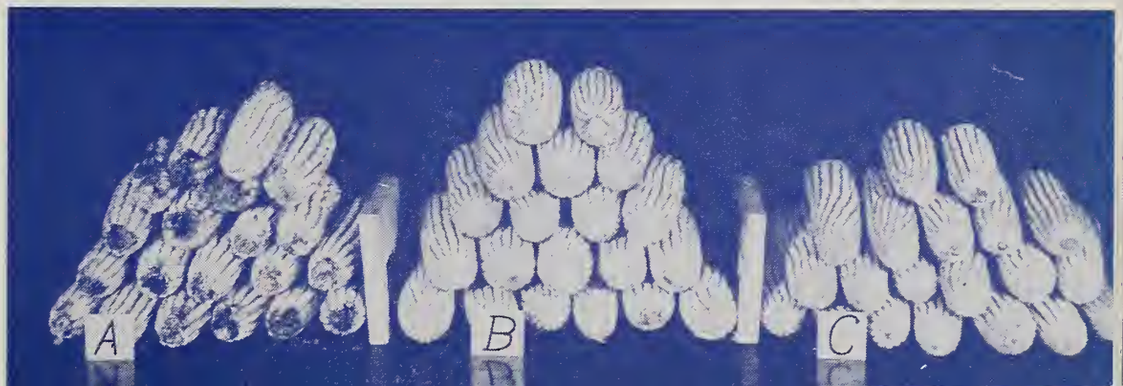
Insecticidal control is expensive, so it is tremendously important to develop corns resistant to the pest.

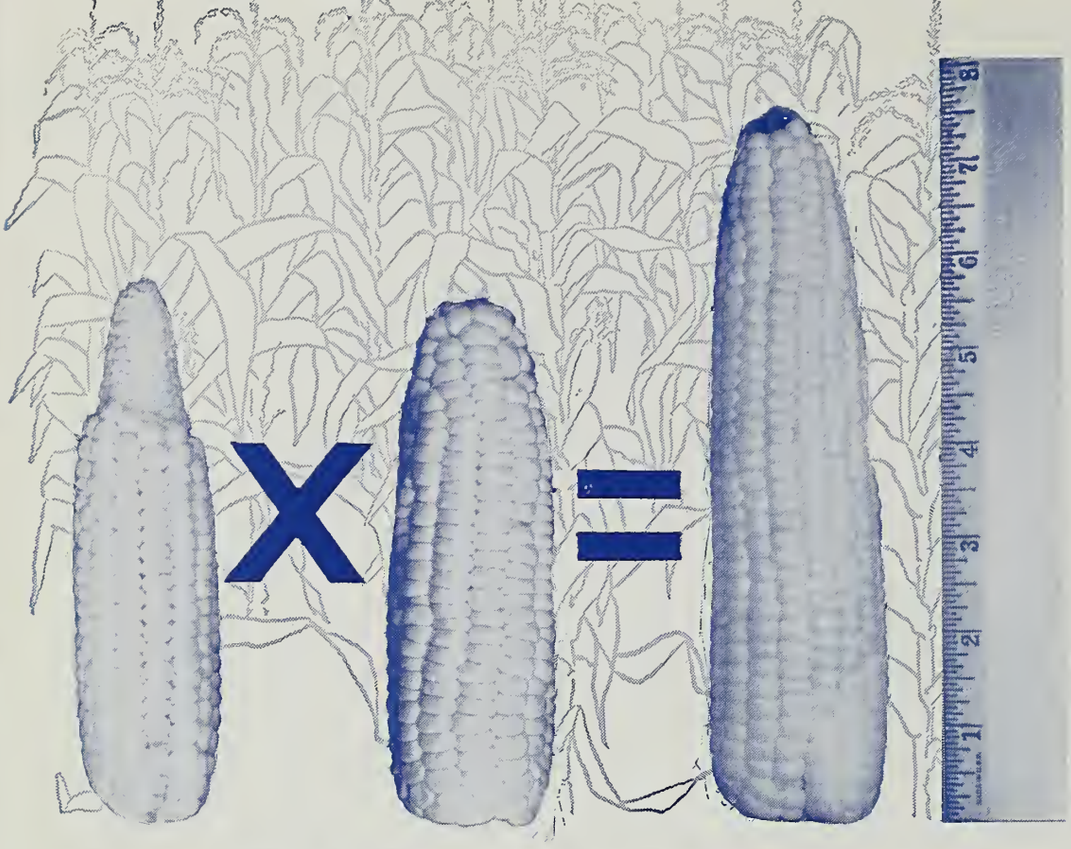
Many factors in resistance

The resistance we have is due to a number of factors. Tight husk is one. Then, too, our researchers have found in the silks of a few sweet corns an unidentified inheritable factor that is lethal to earworm larvae. And some other sweet corns seem to have nutritive qualities that speed up the maturing and emergence of earworms from the ear before they have done much damage. There are other intangible factors. The success of some resistant corns in transmitting their resistance depends largely on their combining ability when crossed with other inbreds. At this point, we know more about effect than cause.

Many widely grown field corns in the South average 16 to 25 damaged kernels an ear under heavy exposure to earworm. Tests show, however, that some hybrids and some inbreds used to produce hybrid seed will re-

EARWORM RESISTANCE of many of our modern field corns (B, C) contrasts sharply with the susceptibility of many commercial varieties being grown, such as the open-pollinated variety A. Single-cross hybrids L503 x L501 in stack B and L503 x Fla. 1 in stack C had the same exposure to corn earworm as did corn A but avoided material damage by the pest.





SWEET-CORN INBREDS 81–1 (left) and 471–U6 (center) developed cooperatively by ARS and the Purdue experiment station at Lafayette, Ind., have been released to seed breeders. Progeny of this cross (right) has good appearance and, like the parents, is highly resistant to the earworm. These ears are relatively free of damage despite intense infestation.

ceive much less damage. These tests were conducted under the Federal-State corn improvement program by ARS entomologist J. W. Ingram and agronomist R. C. Eckhardt and associates at State College, Miss.

Resistant field corn found

Two double-cross hybrids tested in Mississippi (Dixie 18 and Fla. 5002), averaged only 5 damaged kernels compared with 22 kernels in the once-popular Station Mosby variety. Dixie 18's seed parent, F44 x F6, is very resistant to the earworm. Among hybrids tested to date, four other double crosses rated only 11 to 13 damaged kernels compared with 30 for a corn widely grown there.

Although all hybrids tested at Crossville, Tenn., were substantially susceptible, averaging up to 25 damaged kernels an ear, the basis for resistance exists in 1 yellow and 5 white single crosses that averaged only about 5 or less damaged kernels. The inbred CI.7 and its offspring T218 from the single cross with T13 showed some silk resistance to earworm. The problem is to get the right combination of factors for resistance into productive double-cross hybrids.

A practical measure of resistance in breeding lines is the effect they transmit when crossed with other corns. Twelve such inbreds—among the 236 crossed in Louisiana onto the single cross F6 x F44 used as a test of combining ability—produced resistant progeny that had less than six average-sized kernels damaged.

In southern field-corn tests, 6 inbreds with high resistance and 17 with substantial resistance have consistently transmitted this character to single-cross progeny. White inbreds L501, L503, F1, F2, and Mp313 and yellow F6 have high resistance. White F3, F4, Mp331. L95, Mp309, T101, HK61, GT1, GE205, GE247, L87, and Mp335 and the yellow F8, F44, Mp1, Mp410, and Mp426 lines showed significant resistance to earworm through several years of testing.

Sweet corns are improved

Sweet-corn researchers have also made great strides against earworms. Take today's new hybrids Paymaster, Calumet, Huron, Golden Security, and Aristogold Bantam Evergreen, for example. These have 10 to 15 injured kernels an ear in severe infestations in contrast with the 22-kernel average of Golden Cross Bantam.

Further improvement is being sought by ARS entomologist E. V. Walter and agronomist G. M. Smith, of Lafayette, Ind., geneticist S. H. Yarnell, at Charleston, S. C., and cooperating State scientists.

The white inbreds 471-U6 and 81-1, developed with the Purdue experiment station, were released to seed breeders in 1953. The cross of these inbreds has only 6 to 8 injured kernels. And other cooperatively developed hybrids still in the experimental stage have only 3 to 5 injured kernels. Unfortunately, greatest earworm resistance today is in late white sweet corn and must be transferred to the more popular early yellow corns.

The cooperative tests at Lafayette showed that a few inbred lines of sweet corn have a factor in the silks that kills earworm larvae by middle age. When either or both parents in a cross had the factor, it nearly always showed up in the progeny. For example, 40 percent of the ears from one such cross had dead larvae.

Further advances probable

We have a good start on the earworm problem. Some high-quality, productive field and sweet corns already have substantial resistance. In time, we should have resistance incorporated into other commercial corns: resistant lines are available to breeders, and testing and selection for earworm resistance are standard practice in improvement work. ☆

CONQUEST OF THE *Medfly*

Promising reports are coming from the massive counterattack against this dangerous invader in Florida

■ IT NOW APPEARS that the fight to eradicate the Mediterranean fruit fly from Florida is just a matter of time. Six months; perhaps a year—thus range estimates of the experts. But all agree: the job can be done.

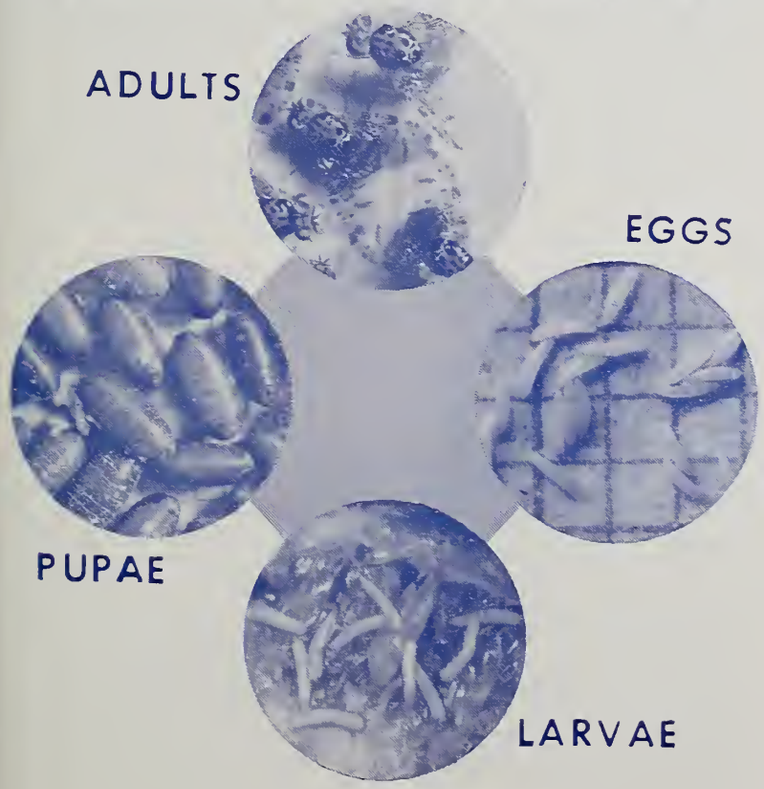
Since April, when the fly was first found in Miami, USDA and Florida's State Plant Board have been geared to an emergency, around-the-clock effort. But you can't let up on the Medfly, even with victory in sight.

This insect attacks and survives on a hundred or more fruit, vegetable, and nursery plants that abound in our southern States the year round. Like other flies, it is a prolific breeder. In south Florida, where it is contained, the fly can develop a dozen or more generations a year. Each female lays as many as 600 eggs.

A more striking way to measure the menace of the Medfly is to chart its invasion of the United States. ARS entomologists piece the picture together this way: The fly sneaked into Florida—probably in baggage arriving at a Miami-area port or airfield—less than a year before it was discovered infesting grapefruit in a Miami backyard. In these months before discovery, the fly had taken some big steps. It became generally established in a thousand-square-mile strip along the southeast Florida coast. Other tourists centers such at Ft. Myers, Tampa, and St. Petersburg contained heavy infestations. Meanwhile, tradesmen and travelers had unwittingly carried the fly to most of the important commercial fruit and vegetable producing areas of the State. Survey crews are still uncovering new "spot" infestations.

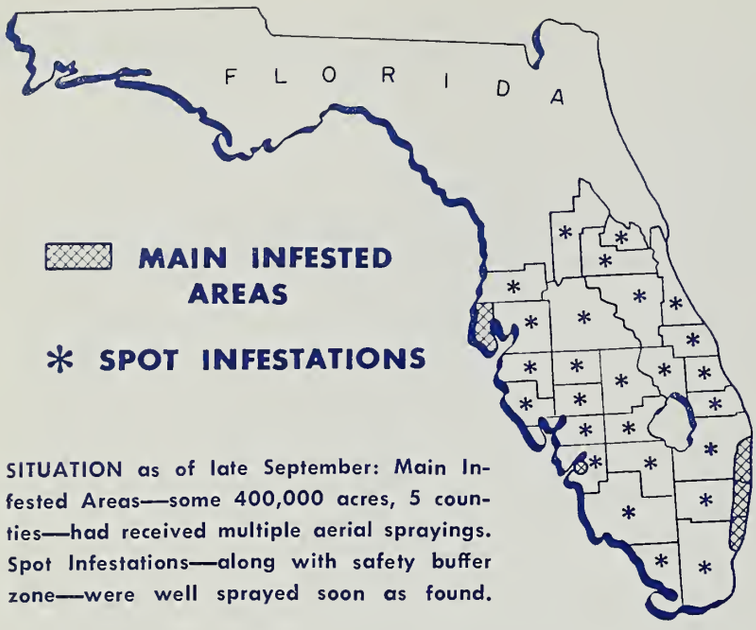
Medfly fighters are relying on *old methods* and *new weapons*. The time-proved methods are surveys, to determine areas infested and extent of infestation; quarantines, to prevent accidental spread; and treatments, to effect eradication. New weapons embrace traps, lures, fumigants, and insecticides—all ready for use because of years of research preparing for such an emergency.

LARVAE, shown in orange, make Medfly costly. It lays its eggs on many fruits, vegetables, nursery plants. Pupae are formed by mature larvae (usually just under soil surface) after leaving rotting fruit.



Bait spray both attracts and kills flies

A bait spray is the key to eradication. Malathion, an organic phosphate that is deadly to the fruit fly but harmless to warm-blooded animals at rates used, is mixed in water with protein hyrdolysate, an attractive Medfly food. This mixture provides a double-barrelled attack. The bait spray can kill by contact or as a stomach poison when



SITUATION as of late September: Main Infested Areas—some 400,000 acres, 5 counties—had received multiple aerial sprayings. Spot Infestations—along with safety buffer zone—were well sprayed soon as found.

the flies eat it. And it not only guarantees a complete kill where applied but also pulls in flies to their death from nearby untreated strips. This makes unnecessary complete coverage of all foliage in an affected area.

The bait spray is applied to infestations every 10 days. Medflies newly emerged from pupation require 6 to 10 days to become sexually mature. Since the bait spray kills for at least a week after application when not washed off by rains, spraying on a 10-day schedule prevents practically all Medflies from initiating a new generation. But only the adult flies are vulnerable to the spray—eggs and larvae are inside fruits, pupae below ground—so the schedule must extend to cover the entire life cycle. This is theoretically accomplished with 5 to 6 scheduled sprays covering a period of 40 to 50 days—generally enough to provide good control in areas of light infestation.

Eradication effort faces many obstacles

But the Medfly is a tough, tenacious pest. In heavily infested areas there is, because of sheer numbers, a greater likelihood of some flies somehow evading a spray. Complicating control are sudden showers that wash off the spray residue soon after application, particularly along the borders of adjoining areas treated on different dates. Mechanical failure of spray planes, bad weather, long ferrying flights, and the continuous problem of laying down an accurate spray swath at high speeds, low altitudes, and in the face of variable winds all give Medflies a better chance of survival. Researchers found that "shiners"—hard-skinned, overripe, mummified citrus still on the tree—could trap larvae inside and extend the life cycle by several weeks. Occasionally, flies get an assist from a homemaker who unknowingly keeps infested fruit in her refrigerator, thus slowing down but not preventing their normal development through the various life stages.

Persistent use of new weapons needed

In Miami, the infestation was so heavy before the first spray that every 100 traps were catching an average of 300 flies a day. Despite the fact that 6 sprays knocked the catch per 100 traps down to 0.3 fly a day, as many as 9 sprays may be required in limited areas.

Once before, in 1929, this fly attacked Florida's fruit crop. Drastic State-Federal efforts eradicated the pest within a year. Destruction of fruit from host plants as in the 1929–30 campaign is not practical now because of high labor costs and the many ornamental and native hosts. Today's Medfly fighters are relying on our improved insecticides and application methods.

Though the control effort is now moving slowly toward its goal, as evidenced by continuing removal of areas from spray treatment, officials anticipate considerable mopping up. Plans call for 40,000 traps to be scattered throughout Florida and manned until the pest is assuredly gone. Only then is intensive trapping likely to be reduced to a routine type of survey that will be on the lookout for Medflies and several related species. ☆

1. Plastic traps are being used to locate Medfly-infested areas and to check on control measures. Entomologist L. F. Steiner, one of USDA's top authorities on the Medfly, hangs one of the streamlined traps he devised. Steiner and his associates at Honolulu developed the bait spray now proving successful against the Medfly in Florida.

2. Traps are checked periodically—1 field man maintains, moves, and checks about 250 units a week. Over 40,000 traps are to be in use in Florida. Cotton wick is treated with insecticide plus oil-of-angelica seed, one of the best lures discovered by ARS researchers. Trapped specimens go to the Medfly headquarters for identification.

3. Entomologists at eradication headquarters identify flies as well as larvae specimens discovered in fruit picked by ground scouts. Results of examinations are relayed to field inspectors so they can inform owners of fly finds on their property. It takes specialized training to distinguish between larvae of Medfly and similar pests.

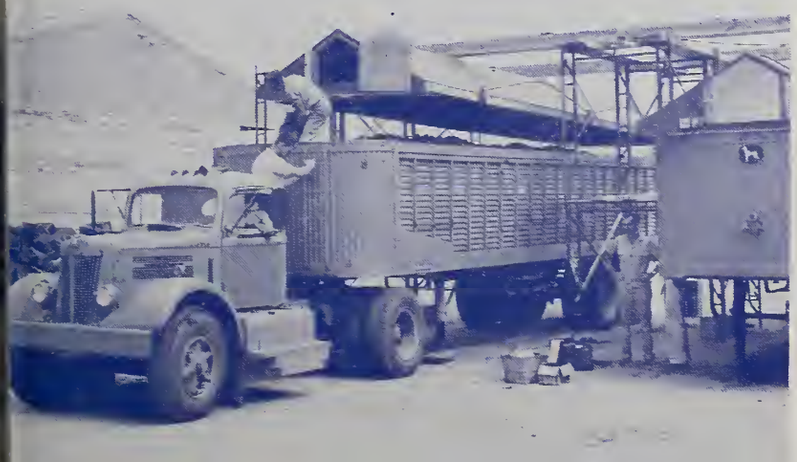
4. When a fly or larvae is positively identified, the area in which it is found goes under quarantine regulation and spraying begins. Here, a reported infestation is discussed and located on the map by USDA entomologists R. H. Foote (right) and F. J. Bartlett. Medfly infestations have been found on about 2,000 properties in Florida.

5. Plane sprays baited malathion over an infested area. Nearly 40 aircraft joined the fight against the Medfly. Applied as water suspension, the insecticide-bait spray sticks to foliage of trees and shrub. Medflies attracted by the bait, feed on it and dose themselves with the poison. Treatment is harmless to man and livestock.

6. In heavily infested areas, soil under known host trees has been hand-treated with a granular insecticide for a radius of several hundred yards. This powerful poison is intended to kill larvae going into ground and flies as they emerge after pupation. The insecticide has a residual toxicity that makes frequent application unnecessary.

7. Fruit is fumigated with ethylene dibromide to make it safe for shipment from infested areas. Fumigation unit pictured is fastened to top of open-body trailer truck. Special fumigation chambers are ready for the current citrus crop. Many of the larger citrus packers are converting degreening rooms to fumigation chambers.

8. Round-the-clock roadblocks were used on roads leading from quarantined areas. Vehicles were searched for host fruits and vegetables that might spread infestation. Much contraband was found despite warnings by newspapers, radio, TV, other media. Reduction in fly population has made it possible to discontinue most roadblocks.



PANTOTHENIC ACID

and how it's measured

This rapid assay method has helped investigate many foods

■ PANTOTHENIC ACID—one of the B-vitamins essential for growth of many animals and microorganisms—was discovered in 1933, but not much was known until recently about its content in foods. The only accurate method that scientists had for measuring it in foods was the expensive, time-consuming bioassay with rat or chick.

Now, however, data are available on pantothenic-acid content of 161 foods. In Agriculture Handbook No. 97, "Pantothenic Acid in Foods," USDA food chemists E. G. Zook, M. J. MacArthur, and E. W. Toepfer give results of their assays using the method that they standardized for extracting the vitamin and measuring the quantity present microbiologically (AGR. RES., January 1954, page 10).

Pantothenic acid occurs widely in nature—in fact, no tissue or food so far tested has been entirely without it. The researchers found liver to be the richest source on a fresh-weight basis, with kidney next. Eggs, yolks especially, were richer than lean muscle meat, which contained more of the vitamin than fruits and vegetables. Most ready-to-eat cereals, whole-grain breads, and nuts, including peanuts, had about the same pantothenic-acid content on a weight basis as muscle meat, fluid milk about half as much.

These new data on pantothenic acid will help nutritionists and physicians plan and evaluate diets for good nutrition. The data will also aid in determining human needs for the vitamin and add to our basic knowledge of substances making up the food supply.

It is possible to assay foods quickly and inexpensively with this microbiological-assay method adopted by ARS researchers at the Agricultural Research Center, Beltsville, Md. The microbiological tests take much less time than tests with other animals.

Before microorganisms could be used, however, researchers had to find a way to release the vitamin when it occurred bound—or combined—with other constituents in a food. *Lactobacillus plantarum*, found best for pantothenic-acid tests, cannot use bound forms even though human beings and other mammals can. Researchers freed the vitamin by treating test food with two enzymes—intestinal phosphatase and pigeon-liver extract. With this treatment, results from microbiological assays agree closely with those from rat bioassays. The Texas experiment station cooperated in these studies. ☆

Preparing food samples

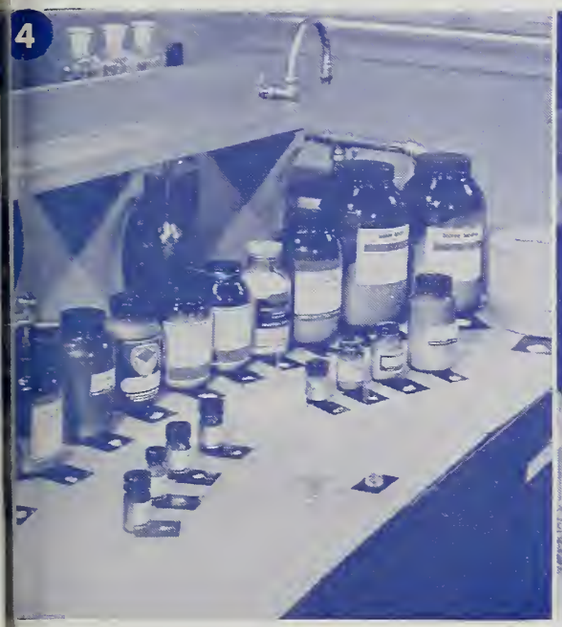
Carrots and beets to be assayed for pantothenic acid content are pared, quartered, and ground in food chopper (1). Portions of at least 10 roots are included in each sample to average out the individual variations. Weighed amounts are placed in a Waring blender with a buffer and enough water to suspend the food particles. Blended mixture is transferred to flasks (2) and autoclaved 15 minutes at 15 pounds pressure to help extract the vitamin and inactivate the enzymes normally present in food. Since part of the vitamin occurring naturally in food is bound or combined with other constituents, food samples are treated with two enzymes: intestinal phosphatase and pigeon-liver extract. These release the bound vitamin into simpler forms bacteria can use. After enzymes are added, the test material is held overnight in water bath at 37° C. (3). After incubation, the material is filtered and the solution put into assay tubes with automatic pipetting machine.

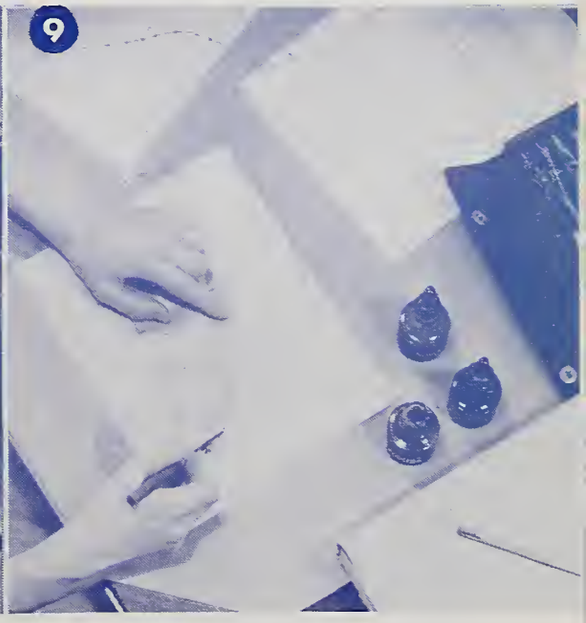
Conducting the assay

Biological assay of foods for nutrients follows the same pattern, whether test animal is a microorganism, a laboratory rat, or a human being: a) basal diet containing every known essential nutrient except the one under test is given; b) test food is fed in carefully regulated amounts calculated to show range of values; c) resulting effect on growth and health of the animal or organism is determined. When *L. Plantarum* is the test organism, titrated lactic acid value is the measure of the pantothenic-acid content of the test food: the more this test organism grows and multiplies, the more lactic acid it forms. Basal diet, without pantothenic acid, for *L. Plantarum* contained 21 nutrient ingredients (4). Combined in solution, they are added to the test material in the assay tube (5) and sterilized. Then the tubes are inoculated aseptically with the microorganisms (6) and incubated for 72 hours in a water bath at 34° C. to promote the growth of the bacteria.

Evaluating the results

The degree of acidity after incubation increases with the amount of lactic acid formed as shown by depth of yellow color resulting with brom thymol blue added as indicator dye (7). Precise quantity of lactic acid in a tube is determined by titration—adding just enough alkali to neutralize the acid. The alkali needed measures the lactic acid present. The automatic titration apparatus shown in center of the picture was designed by Toepfer and Zook (8). Results are graphed on log-log paper, with milliliters of standard alkali plotted against milligrams of test material (9). The top left corner shows a standard curve. Brewer's yeast sample run along with the foods in each assay period serves as control. Curves are drawn for each sample and the pantothenic-acid content calculated from the titration data and standard curve. A close agreement was found between findings of these tests and data obtained in other laboratories and with rat and chick bioassays.





MAKE ROOM FOR FATS

Tallow was nearly crowded out of the soap market, but chemists are aiding a comeback via synthetic detergents

■ SYNDETS FROM TALLOW? Why not, reasoned USDA chemists seeking outlets for the tremendous excess of animal fats caused by a drop in the demand for soap, in favor of syndets (synthetic detergents). After all, some of the earliest and most important surface-active agents were made from tallow 20 or 30 years ago.

Most syndets are more than just cleansing compounds. The term "surface-active agents" embraces their many other industrial applications. These include use as emulsifiers for various purposes and as wetting agents to assist in textile finishing.

Today, most synthetic surface-active agents are based on sodium alkylbenzenesulfonate, from petroleum. Some are made from coconut oil. Only one widely used detergent includes a tallow-based component (about 25 percent of the content).

Part of the reason that syndets are serving the oil industry so well and passing the meat packers by is that petroleum is a cheaper starting material than tallow. ARS chemists A. J. Stirton, J. K. Weil, and R. G. Bistline, Jr., of the Eastern Utilization Research Branch, Philadelphia, Pa., are doing continuous research on this matter. They hope their work will result in larger use of animal fats in surface-active agents.

Already, a large meat-packing firm has started pilot-plant production of alpha-sulfonated fatty acids, one of the direct fruits of ARS research. These compounds can be made simply and cheaply by reacting the saturated acids of tallow with sulfur trioxide. They are good detergents in hard water but do not dissolve readily in water at room temperature. ARS chemists are also preparing derivatives of alpha-sulfonated acids and are evaluating them as detergents and for other possible applications.

Detergents based on tallow

Some better-known tallow-based surface-active agents are the saturated alcohol sulfates. These are made by converting the tallow to alcohol and then sulfating the alcohols.

Recent detergency and foaming tests suggest possible use of these compounds as good surface-active agents with alpha-sulfonated fatty acids and with "builders."

Work well with "builders"

These builders are sodium salts that provide the bulk in most syndets, enabling syndets to sell at a price competitive with soap. Although builders are not considered active ingredients, tests showed that mixtures of 80 percent of a building compound and 20 percent of varying proportions of the saturated alcohol sulfates and alpha-sulfonated fatty acids gave much better detergency than the sulfates and sulfonates used alone.

These tests also suggest that the cheaper alpha-sulfonated fatty acids can be added to the more expensive saturated alcohol sulfates without causing any loss in efficiency. Furthermore, the tests showed that adding alkylbenzenesulfonate to both the saturated alcohol sulfates and sulfonated fatty acids will improve the

FOAMING properties in hard water of three "built" syndets (about 25 percent active ingredient) are shown as compared to soap. "A" is a mixture of sulfated hydrogenated tallow alcohol and alpha-sulfonated hydrogenated tallow acids. "B" is made from sulfated chlorinated tallow alcohols. Foam isn't generally required for detergent action. But most people think so; therefore, acceptability of a household detergent is enhanced if it produces good foam.

WASHING action of the household washing machine is duplicated on small-scale by this Terg-o-Meter. Soiled samples are washed, tallow-based syndets are evaluated. Light reflectance tests check effect on samples.

foaming properties of tallow-based compounds, as is sometimes required.

In making saturated alcohol sulfates, hydrogenation of double bonds occurs. As a chemist would put it, tallow contains a mixture of fatty acids, both saturated and unsaturated. A saturated acid, such as stearic acid, contains a succession of carbon and hydrogen atoms bonded together in its molecular structure in this manner: $CH_2-CH_2-CH_2-CH_2$. An unsaturated acid, such as oleic acid, lacks some of these hydrogen atoms and contains instead double bonds as follows: $CH_2-CH=CH-CH_2$. In the process used to make saturated alcohol sulfates, hydrogen atoms replace the double bonds.

This chemical modification reduces the ability of the sulfates to dissolve and foam in hard water. ARS researchers found two ways to prevent these changes. The first requires use of special sulfating agents that keep the alcohols from being saturated or that sulfate them without attacking the double bond. The other method is to saturate the double bond with chlorine instead of hydrogen so that the compound can be sulfated with ordinary sulfating agents.

Materials' solubility good

Compounds made by either method have good solubility. They also dissolve the other components of tallow alcohol not normally readily soluble. Both the unsaturated and the chlorinated alcohol sulfates are excellent detergents—as good as or better than the alkylbenzenesulfonates.

What's ahead for surface-active agents from animal fats? ARS chemists don't think that 100-percent tallow-based syndets will be used in every washing machine in the country. But they are encouraged by commercial introduction of their alpha-sulfonated fatty acids and are working on new products as well as new applications for old products. ☆

IMPROVING OUR LIVESTOCK AUCTIONS

■ AUCTION MARKETS, which are so important to the livestock industry of the Northeast, could generally improve both service and efficiency by making a few changes in their facilities and operations.

In a joint survey of 155 auctions made in the area by 10 Northeastern experiment stations and USDA, certain features of the auctions appeared to contribute to better livestock marketing. As observed by committee member C. G. Randell, of USDA's Farmer Cooperative Service, the most effective job was being done by auctions that offer convenience, prompt handling of livestock, strong buyer competition, and facilities of a design, size, and location for the needs of the area served.

A site on a good highway or crossroad near the center of the market area is ideal. It also pays to be near a railroad siding and pasturage if the market handles stockers and feeders. Rural sites are preferable because of the likelihood of urban restriction on operations.

It's important to have facilities big enough for the potential sales load and for the community's livestock shows and sales. On the other hand, facilities should not be bigger and costlier than necessary.

Many markets auction few animals per lot and get along very well with a ring just big enough for 10 or 15 head of cattle. Skylights or plastic roofing help give the abundant light so necessary in the ring and yards. Comfortable seats up front for 25 to 40 of the regular buyers, and adequate seating with a view for possibly another 200 patrons and others, will boost business. Additional space for standees is needed on big sale days. Buyers are attracted to auctions that provide private quarters for business calls and conferences. These needs can be met in most pavilions by using all the space efficiently.

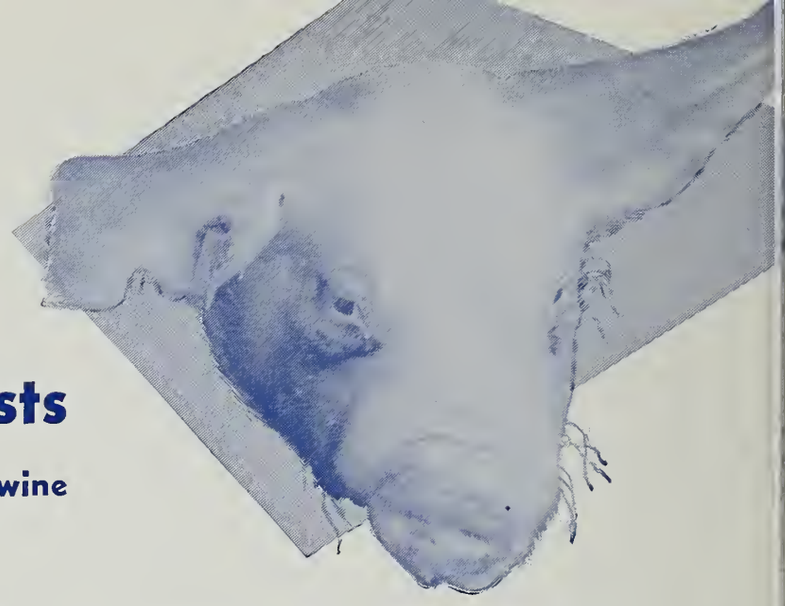
Efficient outside facilities—pens, alleys, and docks—are the key to many prosperous auctions. Pens 24 by 12 feet will accommodate truck and trailer loads of cattle. If made with movable partitions, pens can be reduced for small lots of animals or enlarged for livestock shows. Overhead walkways for inspection of livestock, gates that swing with the planned flow of stock, double alleys to the scales, and plenty of cutting chutes expedite movement of the stock. Pens and alleys should be paved and drained. If alleys are wide enough—at least 8 feet—the premises can then be kept sanitary with power cleaners and trucks.

Having a good professional auctioneer, selling livestock by lots instead of singles where possible, adhering to a sound policy on buyer credit, giving such services as on-the-farm grading and appraisal of livestock weights and values, and doing order-purchasing for customers—all this contributes to sales volume and competition among buyers.

Two innovations are important. With hydraulic gates, an auctioneer can speed movement of animals into or out of the ring—an operation usually requiring 1 or 2 workmen. Another device employs reflectors to project weights from the scale onto a panel in view of bidders. ☆

What ATROPHIC RHINITIS costs

Slow pig growth makes this puzzling swine disease an expensive matter



ATROPHIC RHINITIS has no measurable effect on sows' productivity but does inhibit growth rate of their pigs, say researchers at the Agricultural Research Center, Beltsville, Md.

USDA studies on the economic effects of atrophic rhinitis in an experimental swine herd also showed that the growth-inhibiting effect becomes progressively greater with age. Normal pigs outweighed affected ones by 3.9 percent at 56 days of age and 6.4 percent at 140 days, as well as by 5.2 percent in daily gain.

Veterinarians R. D. Shuman and F. L. Earl, of ARS, were impressed with the continued normal-appearing thriftiness of the herd under study—in contrast to the herd damage expected. This adds to the puzzling and often-contradictory aspect of a disease that has been plaguing our country's herds for at least 12 years.

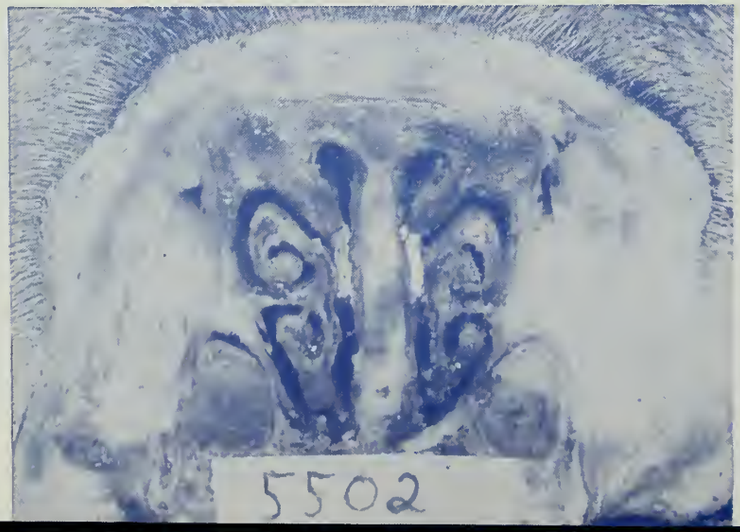
Its cause is still unknown

Reported in the United States only since 1944, atrophic rhinitis is now considered a major disease of swine. Its cause is not yet known. The disease itself does not kill. Major economic loss comes from slower body development. Pneumonia sometimes occurs as a secondary complication. Researchers found in the experimental herd, however, that pneumonia lesions appeared as frequently among animals without evidence of rhinitis as among affected ones. Sometimes, diseased animals show no outward ill effects at all.

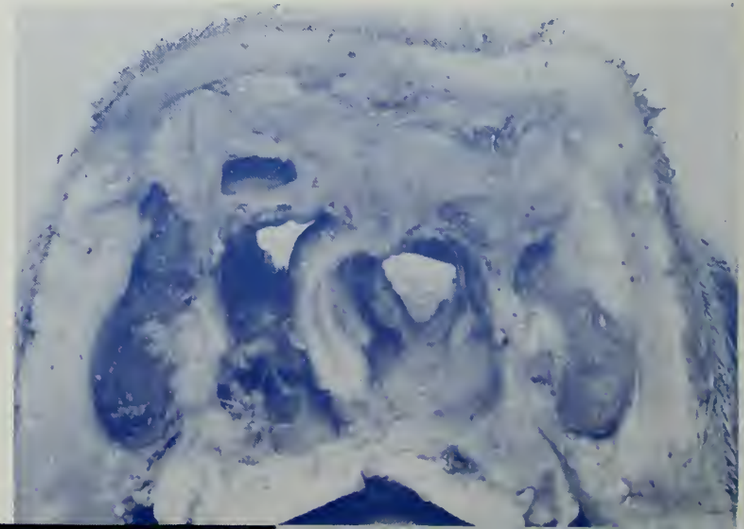
Researchers determined sow productivity by checking total number of pigs born, number living, and weight per individual and litter at 56 days of age. In another test, growth of pigs whose Records of Performance (R. O. P.) were being kept was measured by weight at 140 days of age and average daily gain from weaning to a final weight of about 215 pounds.

Of the 212 sows in the sow-productivity study, 121 were normal and 91 had atrophic rhinitis. Affected sows had more pigs per litter than normal sows—8.9 compared with 8.5. But affected sows had a greater proportion of stillborn pigs per litter than

NORMAL pig's nasal passages contain these delicate, scroll-like turbinates separated by the septum—fairly thick and straight-walled cartilaginous structure. Dorsal turbinates extend downwards from top of nasal passages. Ventral turbinates fill rest of cavity. The air passageways between the turbinates and nasal septum are known as the meatuses. Turbinates warm the air before it goes into the lungs and help filter out foreign material such as dust and bacteria. Mucous membrane covering the turbinates is normally pink and slightly moist.



ABNORMAL appearance of turbinate structures within the nose is fairly typical of damage done by atrophic rhinitis, though considerable variation occurs. Marked bowing of septum and absence of almost all turbinates, as shown, indicates advanced stages of disease. Variation can range from decrease in size or loss of whorls of one or both turbinates, leaving fleshy stumps, to complete absence of turbinates. Severe septum bowing sometimes cause turbinates on one side to flatten, causing compensatory distortion or enlargement on other.



CROOKED snout is sometimes seen in affected pigs. It is caused by an atrophy of structures within the snout, leading to visible distortion of the facial bones. The snout may be turned to either side or upward and have an accordionlike appearance. Persistent sneezing is an early—sometimes only—symptom of the disease. Other symptoms may include nasal bleeding, nasal mucous discharge, coughing, bulging facial bones, irritation of the snout causing the pig to rub it against the ground or some solid object. The associated conditions may include pneumonia, diarrhea, general unthriftiness. No satisfactory treatment for atrophic rhinitis exists as yet.

normal sows—7 percent compared with 4.6 percent. Normal sows averaged 6.8 pigs per litter at 56 days of age compared with 6.2 pigs per litter for sows with atrophic rhinitis. Individual pigs from affected sows averaged 36.8 pounds in weight compared with 36.2 pounds for pigs from normal sows. Average litter weight of the normal sows was 246.4 pounds, of the affected sows 222 pounds.

Unaffected pigs gain faster

Of the 284 R. O. P. pigs studied, 146 were normal and 138 had atrophic rhinitis. At 56 days of age, normal pigs averaged 38.4 pounds, affected pigs 36.9 pounds; at 140 days of age, normal pigs averaged 161.7 pounds, affected pigs 151.3 pounds. The advantage was also reflected in daily gain from weaning to about 215 pounds. Normal pigs gained 1.52 pounds a day compared with 1.44 for pigs with atrophic rhinitis.

Early work showed much variation among breed groups in pigs born, number alive per litter at 56 days, individual weights, and incidence of rhinitis. To eliminate the effect of such differences, all comparisons were made on an intrabreed group basis, using only breed groups in which both normal and affected animals were represented in one season. All data on individual weights and rate of gain were corrected for sex differences. ☆

DETECT, REJECT—*Automatically*

■ THE AUTOMATIC green-rot detector developed by USDA has proved highly accurate in detecting and rejecting green-rot infected eggs under commercial test conditions. Use of the detector to supplement organoleptic (sight and smell) examinations in an egg-breaking plant resulted in liquid egg products with greatly lowered bacteria counts, even though the detector is sensitive to only one type of rot.

Eggs were examined in both spring and summer months to check the seasonal aspects of green rot. Examinations were conducted by combination green-rot detector and organoleptic evaluation, green-rot detector only, and organoleptic evaluation only. Organoleptic testing is routinely used in egg-breaking plants to spot reject eggs.

Green rot is so named because the albumen of infected eggs fluoresces green under ultraviolet radiation (black light). Agricultural engineers of the Agricultural Marketing Service used this characteristic to develop a machine that automatically detects eggs with green rot and sorts them from normal eggs (AGR. RES., October 1954, p. 11). AMS food technologists A. M. Mercuri and J. E. Thomson and agricultural engineer J. D. Rowan were in charge of testing the detector.

In tests this summer, over twice as many bacteria were found in egg albumen that had been examined only by sight and smell as in albumen examined by both the green-rot detector and sight and smell. The bacteria count in egg albumen examined only by the green-rot detector was found to be almost double the count in albumen examined by both the detector and sight and smell. Differences between examinations by green-rot detector and sight and smell were not significant, indicating that the detector is not superior to sight-and-smell examination.

The substantial increase in bacteria noted in the summer compared with spring reflects the greater summer-time incidence of rots among eggs in egg-breaking plants. The detector may be of value in complementing other methods designed to lower bacteria counts during the summer, thereby facilitating compliance with bacteriological standards.

The green-rot detector works best with white eggs and least well for brown eggs. Further refinement of the detector is needed to minimize the number of false positives among brown-egg rejects. ☆

THYROPROTEIN?

NOT FOR THE AVERAGE HERD

Varying responses among individuals and the abrupt decline in milk production after removal are among objections to use of this drug

■ RECENTLY COMPLETED Federal-State experiments in use of thyroactive materials to stimulate milk output in dairy cows show practical value of such drugs is limited.

Many previous trials (AGR. RES., April 1954, p. 15) have shown that thyroprotein, available to dairymen in commercial feeds for a number of years, increased milk production as much as 20 percent in some cows for short periods. Total milk produced for the entire lactation, however, was not increased by the use of thyroprotein when it was fed either for short periods or throughout the lactation.

More recent experiments have shown widely varied responses among individual animals. The tests also demonstrated once more the seemingly inevitable drop off in milk output once the drug is eliminated.

These results, along with other findings, have convinced researchers that use of the drug has little place in average dairy-farm operations.

The latest work was conducted cooperatively by dairy scientists J. W. Thomas and L. A. Moore, of USDA's Agricultural Research Center, Beltsville, Md.; D. V. Kopland, of the Federal-State Dairy Field Station, Huntley, Mont.; and E. A. Keyes of the Montana experiment station.

No way was found to avoid or modify the sharp decline or cessation of milk production that usually follows removal of the drug from the cows. Gradual removal was previously believed to be an effective means of preventing the decline. But this failed, along with abrupt removal and removal over varying periods.

Used in the tests at the 3 locations were 55 cows in 5 groups, and a control group of 17 cows. Records were kept on milk production, butterfat, bodyweight, efficiency of production, and monetary returns. The experimental period included 30 days of pretreatment, 60 days of treatment, a zero to 30-day withdrawal period, and 60 days of posttreatment.

For the first 60 days of thyroprotein use, there was an average daily increase of 6 pounds (15 percent) in F. C. M. (fat-corrected milk), but no change in butterfat. The milk increase, however, was significant in only 8 of 11 group fed the drug.

Varied removal times tried

Withdrawal of thyroprotein after 60 days began with abrupt removal in some groups and removal within 10, 20, and 30 days in others. Withdrawal over the longest period resulted in a more gradual decline in production than abrupt removal but did not prevent the usual precipitous drop when removal was completed.

Further, production decreased in all treated groups following complete removal of thyroprotein and remained below anticipated yields and also below the output of the control cows.

In 2 out of 3 tests, feed efficiency for milk production was similar in treated and control groups if the periods during and after thyroprotein feeding are considered together.

Wide range found in results

Monetary returns above feed costs increased in treated groups that gave the best responses to thyroprotein, but decreased in those that gave average or below-average response.

Chiefly because of the widely varying responses among individual cows, the summed-up results of these experiments do not indicate the need or advisability of thyroprotein feeding in the average dairy herd.

There is, however, the possibility that thyroprotein might be used to advantage by large commercial dairymen. Its use could be a means of stimulating milk output during the periods of normally low production when milk prices are high and when marketing bases are being set up. ☆

A coccidiosis control?

A combination aureomycin-sulfamethazine treatment has proved 100 percent effective in preventing mortality of chicks with cecal coccidiosis under experimental conditions, according to USDA parasitologists.

Sulfamethazine controls the coccidial organisms. The antibiotic aureomycin stimulates chick growth above normal despite the presence of patho-

genic organisms. Best experimental results were obtained from feeding 100 grams (roughly 3½ ounces) of aureomycin per ton of feed with 0.125 percent sulfamethazine. The aureomycin-sulfamethazine treatment must be started when chicks are exposed to infection. No deaths occurred in chicks given this treatment, compared with a mortality rate of 43 percent in the inoculated, untreated group. Inoculated, treated chicks made better gains than healthy, untreated chicks.

These studies at the Agricultural Research Center, Beltsville, Md., showed that aureomycin helped chicks by stimulating their metabolism. Effects on the coccidial organism were not observed by the scientists.

Worms—after 6 years

Rotation of hog pastures alone will not eliminate swine whipworms once a pasture becomes heavily infested with eggs of this hog parasite.

Tests at USDA's Agricultural Research Center, Beltsville, Md., showed that the eggs may survive for at least 6 years in the soil of pastures and lots after hogs are removed.

In 1949, hogs were removed from a small area used for many years as a hog lot. The area was heavily infested with eggs of the swine whipworm. After lying fallow for 2 years, the area was graded and planted to grass. In 1955, parasite-free hogs were put back in the area, which was still covered by a firm grass sod.

Pigs showed no signs of infestation before the experiment began or during the first 50 days on the lot. In about 2 months, after the whipworms had time to mature, the pigs passed eggs of this parasite. Its presence was further confirmed in seven pigs by post-mortem examination.

No known treatment will completely rid hogs of whipworms. Best protection is to provide new pasture for new pigs, say ARS parasitologists.

Well-fed grass grazed

Federal-State study refutes the view that cattle don't like nitrogen-rich grass. This finding means that researchers may now move ahead to find out how well nitrogen-fertilized grass may meet our needs where legumes have lost out in a pasture or aren't adapted for growing with grass.

ARS geneticist G. W. Burton and animal husbandman B. L. Southwell, in cooperation with dairy husbandman J. C. Johnson of the Georgia experiment station, treated strips of 5-year-old Coastal Bermudagrass sod at Tifton, Ga., with various amounts of nitrogen. Each plot was sampled to determine its yield of grass, and cows were then turned in for a 2-hour grazing. After grazing, strips were clipped to find out how much grass remained. The difference in yields measured the grass consumed.

Not only was there more grass following fertilization, but the cattle having free choice of all plots ate more of the enriched grass and did not discriminate against it when extreme amounts of nitrogen had been used. For example, on May 26 they ate 21 percent of the unfertilized grass—but 40 percent of that receiving 200 pounds of nitrogen per acre, 49 percent from the 600-pound plots, 56 percent from the 1,500-pound plots.

Percentages varied during the summer, but the trend was similar.

Advising on research

The 25 USDA research and marketing advisory committees are moving into their tenth year of meetings.

These groups, appointed by the Secretary of Agriculture under the Research and Marketing Act of 1946, represent all segments of agriculture.

Committee members will again offer guidance to the Department in planning research to improve production, marketing, and utilization of the country's agricultural products.

The Agricultural Research Policy Committee, 11-man national advisory group concerned with broader aspects of USDA research, meets quarterly.

Research and marketing advisory committees will meet in Washington except as noted), on these dates:

OCTOBER—Sheep and Wool, 8–10, Dubois, Idaho; Dairy 10–13, Gaines-

ville, Fla.; Food and Nutrition, 29–31. NOVEMBER—Forest, 14–16; Potato, 28–30. DECEMBER—Home Economics, 3–5; Rice, 3–5, Albany, Calif.; Production Economics, 5–7.

JANUARY—Sugar, 9–11; Oilseeds and Peanuts, 14–16, Peoria, Ill.; Re-

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frigerated Frozen Products, 14–16; Poultry, 15–18; Deciduous Fruit and Tree Nut, 22–25; Soils, Water, and Fertilizer, 28–30; Food Distribution, Jan. 30–Feb. 1. FEBRUARY—Vegetable, 4–7; Feed and Forage, 11–13; Tobacco, 18–20; Grain, 25–27; Farm and Home Equipment and Structures, Feb. 26–Mar. 1, Auburn, Ala. MARCH—Citrus and Subtropical Fruit, 4–6; Seed, 4–7, Davis, Calif.; Livestock, 6–8; Cotton and Cottonseed, 11–13; Transportation, 18–20.

Use of fats in candy

How do fats and oils behave in candies? How are they affected by combining with other ingredients and by processing and handling methods?

Researchers at USDA's Southern Utilization Research Branch, New Orleans, La., hope to find the answers in new work on confectioners' fats. Researchers also expect to get information that may be useful in developing new forms of fats and oils chemically tailored to fit confectioners' requirements for specific uses.

Work will be done cooperatively with the National Confectioners' Association as part of the research on utilization of agricultural products sponsored by this organization.

Commission names head

Wheeler McMillen, nationally known agricultural leader and farm-magazine editor, has been appointed executive director of the newly created bipartisan Commission on Increased Industrial Uses of Agricultural Products. This five man Commission was appointed in July by President Dwight D. Eisenhower under the Agricultural Act of 1956.

The Commission's function is to develop legislative and other recommendations to bring about wider use of agricultural commodities in the manufacturing of industrial products. The group is concerned with extending uses of present crops, especially those in surplus, and with developing new crops to provide continuing sources of raw materials.

Members of the Commission are J. Leroy Welsh (chairman), Omaha, Nebr., grain operator and member of the Board of Regents of the University of Nebraska; George H. Coppers, Englewood, N. J., president of the National Biscuit Company; Karl D. Butler, Ithaca, N. Y., farm counselor;

Frank J. Welch, Lexington, Ky., dean of the College of Agriculture, University of Kentucky; and Dr. Charles R. Sayre, Scott, Miss., president of the Delta and Pine Land Company.

Although the Commission's headquarters are in offices provided by the USDA in Washington, it is an independent body, responsible directly to the President and to Congress.

This Commission plans to survey and appraise all current crop-utilization work by research organizations throughout the country and welcomes suggestions for expanding non-feed and non-food uses of farm products.

Poultry award winner

B. R. Burmester, USDA biologist at the Regional Poultry Research Laboratory, East Lansing, Mich., will receive the Tom Newman Memorial International Award for Poultry Husbandry Research for 1956. This award is presented annually by the Poultry Association of Great Britain for "the most important contribution in poultry husbandry work, published the previous year."

As a member of the ARS research staff since 1940, Burmester has conducted investigations on avian lymphomatosis and related diseases. His published research in this field in 1955 was the basis on which the award was made. He has demonstrated that lymphomatosis virus can be present in hens appearing normal, and that it is shed in their eggs. Further, he has shown that when the virus is injected in a hen, a passive immunity is imparted to the chicks. This finding alone is highly significant because of its implications in developing immunizing procedures.

The award consists of a medal and about 50 pounds £. It is given to commemorate services of the late Tom Newman, English poultryman, to poultry husbandry and as one of the founders and first secretary of the Poultry Association of Great Britain.

Burmester won the Poultry Science Research Award in 1940, the Sigma Xi Junior Research Award in 1948.

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